



MADAGASCAR: which future?

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My visit to the Madagascar National Reserve has allowed me to estimate the important wealth of the fauna and the flora of this island, the surface area of which exceeds that of France. It is enough to cross the country off the beaten track to realize that the situation is more tragic than it really appears.

The first inhabitants of the island arrived approximately 2500 years ago. At that time, the country was covered with forests. Deforestation began with the earliest people but has accelerated with the population growth. Since 1950, the primary forest has declined by more than 50%. 300,000 hectares have been destroyed every year. We consider that, at the moment, 92% of the original forest has disappeared, which has consequently resulted in the disappearance of numerous botanical and animal species. Of 36 species of Lemurs living in Madagascar, 14 have already disappeared.

The journeys which I made on the island in recent years has allowed me to estimate the acceleration of the degradation of some biotopes. The most important 3 plagues are deforestation, slash-and-burn farming, and over-grazing, and to these we may add the invasion of introduced plants.

Deforestation:

The felling of trees is forbidden. Nevertheless, the natives penetrate into the forest and make regular felling hoping that their activity pass unnoticed. These cuttings provoke "holes of light" which lead to the disappearance of ombrophilous plants. So, in the Mountain of the Français, North of the island, it is easy to notice the rarefaction of epiphytic orchids, ground orchids (*Oeceoclades*), *Impatiens tuberosa* etc. in the places where the vegetation cover has become insufficient.

In 2006, I took time again to see the primary forest of Ambositra after a first visit 3 years earlier. The changes were considerable. Part had been cut and burned (**photos 1A and 1B**). Some chameleons, which had not died in this chaos, roamed on the ground in the ash. For the rest of the area, wild fellings had cleared up the forest and I found the same as I had been able to noticed in the Mountain of the Français, the disappearance of



1A. In 2003, primeval forest S. Ambositra.
(photo : J.A. Audissou).



1B In 2006, the same forest, partially burned S. Ambositra (photo : J.A. Audissou).

numerous orchids, *Kalanchoe* and epiphytic *Peperomia* etc. ...

At Cap d'Ambre, immense meadows have replaced the forest. Only some "islands" with the original vegetation remain (**photo 2**), thanks to their status of "Fady". "Fady" is a set of prohibitions aiming to respect the memory of the ancestors. It may be dangerous to break these often very complicated rules.

In some regions like near Tuléar, deforestation has made wood rarer and the price of charcoal is now five times more expensive than the national average.

John Lavranos, with whom I visited the region of Ambalavao in 2005, confided in me that this region was still covered with forests only thirty years ago. The small reserve of Anja (**photo 3A, 3B and 3C**) is an illustration of what could represent the previous landscape.

Mangrove swamps also underwent irreversible damage on numerous littoral strips, causing a profound imbalance to the coastal ecosystems.

Over-grazing and slash-and-burn farming:

The Malagasy livestock consisted of a dozen million Zebus and a large number of goats causing heavy pressure on the still existing ecosystems. Indeed, some regions are no more than immense grassy plains which replaced the xerophilous forest (**photo 4**). Slash-and-burn, which, at first allowed vast areas of meadow, is now intended to help the regrowth of the wild grasses during the dry season (**photo 5**) and is practiced once or twice a year. With fire, the local population has a precious tool for the control of meadows, but unfortunately it is used too often without proper judgment. Large land areas are burned pointlessly, leaving only a tiny selection of the natural flora. In the mountainous regions of the centre, only rocky domes are saved from fire so protecting an original flora consisting mainly of succulents and orchids. In these regions, we also can measure the erosion caused during the rainy season by the outflow of water on bare grounds (**photo 6**). *Aloe macroclada* is a typical example of a plant formerly very plentiful and which now is rare considering its very large distribution area. This large *Aloe* has the capacity to

withstand a large number of repeated fires, but it is not invincible. (**Photo 7A and 7B**); another example concerns *Aloe albiflora* which has not been found since its discovery by Boiteau in 1939. In 2003, I participated in a an exploration party steered by Norbert Rebmann to try, among others, to find this very localized species in the region of Tsivory. Alas the journey was in vain. It is a region very affected by slash-and-burn farming and it is very likely that it disappeared for ever.

In the South of Madagascar, over-grazing is most devastating. Xerophilous forests of Didieraceae are invaded by millions of zebus and goats, especially during the dry season, that is two thirds of the year. All the plant cover is grazed or trampled resulting in the disappearance of numerous ombrophilous plants such as *Ceropegia* sp ., *Senecio* sp ., *Euphorbia* sp ., *Stapelianthus* sp. etc. ... The region of the salty Lake of Ihoda, east of Tsiombe, is one of the many examples. Until quite recently the forest around this lake was considered well preserved, but my visit in 2006 was able to measure the enormity of the damage.

Disappearance of plant cover in these forests results in a degradation of soil. The state of this old two-headed *Aloe suzannae* (**photo 8A and 8B**) shows a plant that withstood cyclones, for centuries but has collapsed due to soil erosion...

Introduced plants:

A plantation of *Agave sisalana* is a typical example of introduction of a foreign plant for economic purposes. In the region of Amboasary, thousands of xerophilous hectares of forests have been destroyed to allow the cultivation of this *Agave*, known for centuries for the quality of the fibre (**photo 9**). Relics of original forest remain on the surrounding hills, but as everywhere else, the degradation of the vegetation directly induces soil erosion and the disappearance of numerous endemic species. Having visited the region twice within 3 years, I was able to notice in some areas the disappearance of *Euphorbia ambovombense* var. *ambatomenaensis*. *Aloe ruffingiana*, although still abundant at some locations, suffers from the disappearance of Didieraceae which normally provides the necessary shade for optimal development.

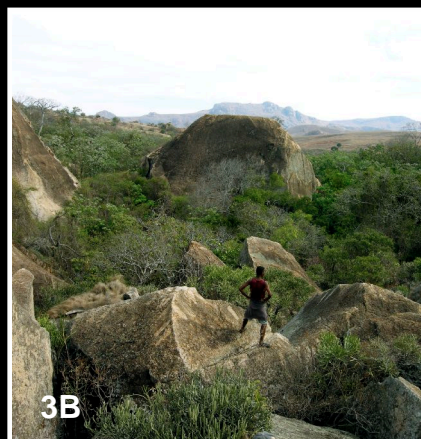
Agave ixtlii, a compact form of *Agave angustifolia*, is used to make hedges and enclosures for cattle, but the species produces on the inflorescence, an large quantity of bulbils, which, by falling on the ground, proliferate, suffocating the local vegetation.

Opuntia monacantha, introduced in the XVIIIth century, is used in the same way around houses and fields and makes impenetrable barriers for protection. Facing the proliferation of this cactus (**photo 11**), in 1923, it was decided to introduce a mealybug to annihilate the plague. Success was attained in just 4 years, then the parasite disappeared and the invasion started all again but even more vigorously. *Opuntia ficus-indica* var. *anacantha* is planted to serve as food for zebus during the dry season. The herdsmen start fires at the foot of the plants to burn spines.

In spite of its status, the reserve of the Cap Sainte Marie, at the southern tip of the



3A. Reserve of Anja S. Ambalavo (Photo : J.A. Audissou).



3B. Reserve of Anja S. Ambalavo (Photo : J.A. Audissou).



3C. Reserve of Anja, Maki (Photo : J.A. Audissou).



4. *Didiera trollii*, S. Beraketa. Remains of the dry forest. (Photo : J.A. Audissou).



6. Lavaka & slash-and-burn, Itremo (Photo : J.A. Audissou).



Reserve of Anja S. Ambalavo (Photo : J.A. Audissou).



7A. *Aloe macroclada*, Itremo (photo : J.A. Audissou).



7B. *Aloe macroclada* destroyed by slash-and-burn (photo : J.A. Audissou).



8A. Left. In 2003, a two-headed *Aloe suzannae*, Ranomainty.
8B. above : the same in 2006. (photos : J.A. Audissou).

island, appears to be abandoned. Every year, opuntias extend their range a little more and goats graze without constraint. In 2005, the guards confided in me that they were going to proceed with the eradication of opuntias, but one year later, nothing seemed to have changed.

The attempts at reforestation are also source of introduced foreign species. Plantations of various tree species (*Eucalyptus* sp., *Pinus* sp., Locust tree sp.) began one century ago to mitigate the lack of firewood and timber and stop soil erosion. Regrettably, erosion continues progressing because it is not uncommon for such areas to become victims of uncontrolled slash-and-burn farming. It is also necessary to say that nothing grows under some species, such as *Eucalyptus* and *Pinus*. South of Manambaro in the region of Fort Dauphin, the original vegetation is slowly disappearing for the benefit of eucalyptus which sterilizes soils. So, *Euphorbia francoisii* (photo 10) is seriously threatened with extinction.

In the Ambositra region, plantations of *Pinus* sp. are damaging and replacing the local vegetation. At Ivato, *Aloe conifera* does not remain except on granitic domes unfit for the establishment of these conifers. Unfortunately, numerous other examples could be quoted.





11 *Opuntia* in a xerophilous forest (photo : J.A. Audissou).

Finally, it is necessary to speak about regional development, notably mining developments, even if the phenomenon is still anecdotal. In the region of Fort Dauphin Southeast of the island, an immense coal deposit was discovered and should be exploited soon. It is an opencast deposit which will destroy hundreds of hectares of vegetation. The region is known for its important biodiversity of succulents (*Aloe* spp ., *Euphorbia* spp. etc.), carnivorous plants (*Nepenthes* spp.), Orchids etc. ... It is regrettable that no botanical prospecting was carried out before the opening of the mine.



For the evacuation and the transport of the coal, a main road and harbour works are in progress. A new harbour is in progress and all the coast West of Fort Dauphin is disfigured. These hills (**photo 12A and 12B**) sheltered in particular *Aloe bakeri* and are now being destroyed with explosives to level the ground and produce building material.

Certainly, there are still numerous species to be discovered. The description of new species every year shows this. Generally, these plants grow in difficult-access locations



and are often discovered by teams of local collectors, capable of crossing long distances on foot during 15 days - 3 weeks or more, camping wherever and feeding frugally. *Aloe pronkii*, *A. florenceae* etc. recently described were discovered in these conditions and their description does not contain precise references of locations.

But next to it, numerous species, met frequently one century ago, have disappeared for ever. Without counting those that disappeared before having been able to be described!

It is illusory to think that it is possible one day to re-plant the areas where any vegetation disappeared. Indeed, the soils, which are not any more protected from the erosion by plant-cover, become sterile. “Lavaka”, these profound wounds due to this erosion, testify of it (**photo 6**).



CONCLUSION

This article was not written to make a judgment about the ancestral traditions and the social behaviour of a population classified among the poorest people of the planet. It is, for these miserable people a simple question of surviving by all means given by nature, even if these means condemning themselves for an even bigger

impoverishment in the very short term. The population growth and the deficiency of the political authorities seem to point towards irreversible black future for this country.

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12A. In 2003, Site of *Aloe bakeri* Fort Dauphin (photo : J.A. Audissou).



12B. In 2006, Site of *Aloe bakeri* Fort Dauphin (photo : J.A. Audissou).

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